# CERCLA Preliminary Assessment

For:

Humboldt Mill
Humboldt Township, Marquette County, Michigan
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DECEMBER 2010

**PRELIMINARY ASSESSMENT**
Humboldt Mill

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## Section 1.0 Introduction

On March 1, 2010, the Region 5 Offices of the United States Environmental Protection Agency's (U.S. EPA) tasked Weston Solutions, Inc. (WESTON®), to conduct a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Preliminary Assessment of the Humboldt Mill Ore Processing Facility (Humboldt Mill, or the Site) property. The property in question is an approximately 1,242-acre parcel of land formerly used for beneficiating ores located in the northern portion of Humboldt Township in the Upper Peninsula of Michigan. This Preliminary Assessment was initiated by a request from the Keweenaw Bay Indian Community on February 5, 2010.

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Title 40 of the *Code of Federal Regulations* [CFR], Part 300) requires that a Preliminary Assessment be performed on all sites entered into the Comprehensive Environmental Response, Compensation, Liability, and Information System (CERCLIS), the U.S. EPA's inventory of hazardous waste sites.

A Preliminary Assessment is the initial step in the Superfund process, which involves a limited-scope investigation and collects readily available information. The Preliminary Assessment is designed to distinguish between sites that pose little or no threat to human health and the environment and those that require further investigation. The Preliminary Assessment also supports emergency response and removal activities, fulfills public information needs, and generally furnishes appropriate information about the site early in the CERCLA assessment process.

If the findings of the Preliminary Assessment determine that further investigation is necessary, the site will continue to progress through the Superfund investigative process and undergo a CERCLA Site Inspection. The Site Inspection will evaluate the extent that a site presents a threat to human health and the environment. This evaluation may be accomplished through the collection and analysis of waste and environmental media samples to determine whether hazardous substances are present at the site and are migrating to the surrounding environment. The Site Inspection provides necessary information required to determine if the

site qualifies for possible inclusion on the National Priorities List (NPL) or should have No Further Remedial Action Planned (NFRAP) status.

At any time throughout the Superfund evaluation process, the site may have a NFRAP status, be referred to another state or federal cleanup program, or be recommended for further action. The Preliminary Assessment is performed under the authority of CERCLA.

## Section 2.0 Site Background

### Section 2.1 Site Description

The Site is an approximately 1,242-acre parcel of land located immediately southeast of the intersection of State Routes 28 and 95. The Site property is located in Sections 2, 11, and 12, Township 47 north, and Range 49 west. The Site is located in a rural area of Marquette County in the Upper Peninsula of Michigan. The approximate central point of the Site property is located at 46.485867 latitude and -87.898075 longitude. Figure 1 shows the Site location.

The Site contains a buried pyrite trench, a tailing disposal facility, diesel and gas underground storage tanks (USTs), a crusher plant, an old crusher building, an electrical substation, an Office/Maintenance building, a main Mill building, a pyrite above-ground storage tank (AST), a former pallet plant, a former concentrate plant, a former pyrite stockpile, the south storage pile A, a fuel oil AST, a former leach residue stockpile, a stormwater outfall and a septic system. Figure 2, Site Features shows these areas of the Site.

The Site is bordered by State Route 28 to the north, vacant land and Lake Lory to the east, vacant land and wetlands to the south, and State Route 95 to the west. The L'Anse Indian Reservation is located approximately 23 miles from the Site.

The Site is relatively flat. Surface water runoff from the northern and western portions of the Site drains to wetlands on the west side of the Site. Water from the wetlands ultimately flows into the Black River. Surface water runoff from the eastern portions of the Site drains to the wetlands of Lake Lory. Waters from these wetlands also ultimately flow into the Black River.

## Section 2.2 Site History

The Site began operation as an iron ore processing facility in 1954 and operated until 1979. In the early 1980s, the Humboldt Mill was refurbished to process gold ore containing metallic sulfide materials from the nearby Ropes Gold Mine. The Site operated as a gold ore processing facility from 1985 to 1989. Previous environmental investigations have documented that waste materials, including processed ore, metal sulfides, and processing chemicals, were improperly disposed at the Site. In the late 1980s, approximately 1.8 million tons of waste was reportedly deposited into an on-site lake. The Site has been inactive since 1989. In 2008, Kennecott Eagle Minerals Company (Kennecott) purchased the Site.

In December 2008, Kennecott submitted a Part 632 Permit Application to the Michigan Department of Environmental Quality (MDEQ), Office of Geological Survey, requesting to reinstate operation of the Humboldt Mill to process metallic sulfide ore and dispose of process wastes into the on-site lake. The permit application included a monitoring and environmental protection plan, including a treatment and containment plan.

On March 26, 2009, Kennecott filed a Notice of Migration of Contamination for the Site as required by Michigan State law. The notice lists the following 26 hazardous substances that had been detected in groundwater beneath the Site: aluminum, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, cyanide, iron, lead, lithium, manganese, mercury, nickel, selenium, silver, sulfate, zinc, ammonia, naphthalene, Aroclor-1242, benzene, ethylbenzene, methylene chloride, and xylenes.

On February 5, 2010, the Region 5 Offices of the U.S. EPA received a written petition from the Keweenaw Bay Indian Community to conduct a CERCLA Preliminary Assessment of the Humboldt Mill property. The Keeweenaw Bay Indian Community (and other tribes) retains hunting and fishing rights in the vicinity of the site.

## Section 2.3 Regulatory Status

A review of existing records suggests that the Site is not subject to Resource Conservation and Recovery Act (RCRA) corrective action authority. Currently available

information does not indicate that the Site is under the authority of the Atomic Energy Act (AEA); Uranium Mine Tailings Action (UMTRCA); or Federal Insecticide, Fungicide, or Rodenticide Act (FIFRA). The Site is currently not enrolled in the MDEQ Site Remediation Program.

## Section 3.0 Past Environmental Investigations

In August 2008, Foth Infrastructure and Environment, LLC (Foth), completed a combined Phase I and Phase II Environmental Site Assessment (ESA) for the Site. In December 2008, Kennecott submitted a Part 632 Permit Application to the Michigan Department of Environmental Quality (MDEQ), now the Michigan Department of Natural Resources and Environment (MDNRE).

The Phase I ESA identified recognized environmental conditions (REC) that indicated either the potential for the release of hazardous materials to the environment or that a release had occurred. The Phase II ESA was conducted to determine the presence or absence of hazardous substances related to the RECs identified during the Phase I ESA. As part of the Phase II ESA, Foth collected soil, groundwater, surface water, sediment, and stockpile samples for laboratory analysis as summarized below.

Foth collected 91 soil samples from the Site for analysis for metals, cyanide, and volatile organic compounds (VOC). The following 16 metals were detected in the soil samples: aluminum, antimony, arsenic, boron, cobalt, iron, lead, lithium, magnesium, manganese, molybdenum, nickel, selenium, silver, thallium, and zinc. Cyanide was detected in five of the soil samples. Four VOCs were detected in the soil samples, including 1,2,4-trimethylbenzene; 1,3,5-trimethylbenzene; n-propylbenzene; and s-butylbenzene.

Foth collected 36 groundwater samples from the Site for analysis for metals, ammonia, sulfate, and VOCs. The following 13 metals were detected in the groundwater samples: aluminum, arsenic, beryllium, cadmium, chromium, cobalt, copper, iron, lithium, manganese, nickel, vanadium, and zinc. Nitrogen and sulfate also were detected in the groundwater samples. Three VOCs were detected in two of the groundwater samples, including benzene, ethylbenzene, and xylenes.

Foth collected 23 surface water samples for analysis for metals. The following seven metals were detected in the surface water samples: copper, lead, manganese, mercury, nickel, silver, and zinc.

Foth collected 25 sediment samples for analysis for metals. The following seven metals were detected in the sediment samples: arsenic, chromium, cobalt, copper, lead, nickel, and silver.

Foth collected 20 stockpile samples from the Site for analysis. The following 13 metals were detected in the stockpile samples: aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, and silver. Cyanide and three PCBs, including Aroclor-1260, Aroclor-1254, and Aroclor-1242, were also detected in the stockpile samples.

# Section 4.0 Potential Sources

## Section 4.1 Source

Ore beneficiation is the processing of ores to (1) regulate the size of the product; (2) remove unwanted constituents; or (3) improve the quality, purity, or grade of the desired product. Typical beneficiation steps applied to iron ore include milling, washing, sorting, sizing, magnetic separation, flotation, and agglomeration. The milling of extracted ore produces uniform-sized particles through crushing and grinding processes. As many as three crushing steps may be required to reduce the ore to the desired particle size. Milled ore in the form of slurry is then pumped to the next beneficiation stage.

Thickening and filtering processes remove most of the liquid from both slurried concentrates and mill tailings. Thickened tailings are discharged to a tailings impoundment; the liquid is usually recycled to a holding pond for reuse at the mill. Chemical flocculants, such as aluminum sulfate, lime, iron, calcium salts, and starches, may be added to increase the efficiency of the thickening process.

Tailings are a common mining waste. Wastes generated by mining and beneficiation processes are classified as RCRA hazardous wastes. However, it does not appear that the facility

is RCRA regulated. Most beneficiation processes generate tailings, which contain a mixture of impurities, trace metals, and residues of chemicals used in the beneficiation process. Tailings usually leave the mill as slurry consisting of 40 to 70 percent liquid mill effluent and 30 to 60 percent solids; liquids are commonly reused in milling processes. Most mine tailings are disposed of in on-site impoundments. Design of the impoundment depends on natural topography, site conditions, and economic factors. Generally, it is economically advantageous to use natural depressions to contain tailings. Impoundments are designed to control the movement of fluids both vertically and horizontally.

The sources identified at the Site are summarized below.

**Underground Storage Tank (UST) Site:** This site is located north of the Office/Maintenance building and consists of a leaking UST site that was remediated. The USTs contained fuel oil, diesel, and gasoline. It appears that the Site has not yet received closure approval for the UST site from U.S. EPA or MDNRE. This area of the Site probably qualifies for petroleum exclusion if other site contaminants are not present within this area and if there is no commingling of any groundwater plumes.

**Laboratory Assay Waste Containers**: These containers are located in the lunch room of the on-site office/maintenance building, and samples from these containers have failed the Toxicity Characteristic Leaching Procedure (TCLP) criterion for lead. Rain water has leaked through the roof and has caused the fiber drums to deteriorate and stain the floor.

**Fuel Oil Aboveground Storage Tank (AST)**: This fuel oil AST may qualify for petroleum exclusion if the AST was used for storing fuel oil.

**Containers in Mill Building**: The Mill building contains numerous piles and open containers of former process material at several locations. The samples collected from the Mill building showed that cyanide, lead, iron, arsenic etc. were present.

**Pyrite Stockpile Area:** This area is located immediately south of the Mill building and was used to store process materials. Soil samples collected from this area showed isolated detections of cyanide, arsenic, silver, and antimony.

**Buried Pyrite Trench and Truck Scale Area:** Pyritic floatation concentrate was buried in a trench north of the main access road to the Mill building. Soil samples from this area have contained elevated levels of arsenic, cadmium, chromium, copper, lead, nickel and silver.

**PCB Transformer Areas:** Formerly there were several PCB containing transformers on-site that were removed and disposed. Previous sampling has shown PCB contamination in three areas within the mill building where PCB transformers were present .

**Septic Drainfield and Stormwater Outfall**: The floor drains in the Site buildings are connected to sanitary sewers that discharge to a drainfield. A stormwater or process water outfall was identified that discharged into a wetland adjacent to the septic drainfield. Soil samples collected from this area contained several petroleum-related compounds.

**Crusher Building**: Drums containing grit blast are stored in this building, which contains numerous piles and other closed containers of process materials. These materials have not been characterized.

**Iron Ore Concentrate Piles**: Two piles of iron ore concentrate are located south of the Mill building. Iron Ore concentration pile are located adjacent to former pyrite stockpile.

As part of the Phase II ESA, Foth collected 91 soil samples and 20 stockpile samples from the Site. The soil samples were analyzed for metals, cyanide, and VOCs. Analytical results indicated the presence of 16 metals (aluminum, antimony, arsenic, boron, cobalt, iron, lead, lithium, magnesium, manganese, molybdenum, nickel, selenium, silver, thallium, and zinc), cyanide, and four VOCs (1,2,4-trimethylbenzene; 1,3,5-trimethylbenzene; n-propylbenzene; and s-butylbenzene). The stockpile samples contained 13 metals (aluminum, antimony, arsenic,

barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, and silver), cyanide, and three PCBs (Aroclor-1260, Aroclor-1254, and Aroclor-1242).

## Section 5.0 Pathway Discussions

### Section 5.1 Groundwater

The groundwater pathway is of concern because of (1) the potential for contaminants to migrate to local groundwater based on the characterization of geological conditions underlying the Site and (2) the existence of and potential impact on drinking water wells and resources in areas where Site-related contamination may have migrated to groundwater.

The Site is located near the intersection of State Routes 28 and 95 in Humboldt Township. Groundwater below the Site flows northwest and discharges to wetlands that discharge to the Middle Branch of the Escanaba River.

The geology of the area consists of unconsolidated glacial till overlaying thin units of slate, quartzite, and iron of the Menominee bedrock formations. The bedrock geology below the southern portion of the Site consists of gneiss, migmatite, and amphibolite of the Migmatitic Gneiss and Amphibolite (Late to Early Archean) Formation. The bedrock geology below the northern portion of the Site consists of meta-volcanic rock of the Baraga Group of the Michigamme Formation.

As part of the Phase II ESA, Foth collected 36 groundwater samples from the Site. The groundwater samples were analyzed for metals, ammonia, sulfate, and VOCs. The following 13 metals were detected in the groundwater samples: aluminum, arsenic, beryllium, cadmium, chromium, cobalt, copper, iron, lithium, manganese, nickel, vanadium, and zinc. Nitrogen and sulfate also were detected in the groundwater samples. Three VOCs were detected in two of the groundwater samples, including benzene, ethylbenzene, and xylenes.

The following substances detected in the groundwater samples also were detected in the stockpile samples collected as part of the Phase II ESA: aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, manganese, and nickel. Therefore, an observed release to groundwater is documented at the Site.

The nearest well to a source area is located more than ¼ to ½ mile northwest of the Site.

The Site is located in a rural area with private residences that use private water supply systems. Approximately 496 private wells are located within a 4-mile radius of the Site. In Marquette County, the average household contains 2.35 people. Based on this information, the private wells serve approximately 1,165 people as the table below shows. There could be private residences with drinking water wells on-site and this will be confirmed during future investigations, as necessary.

| Distance From Site | Estimated Number of Private Wells | Estimated Number of People Served |
|---|---|---|
| 0 to ¼ Mile | 0 | 0 |
| > ¼ to ½ Mile | 25 | 59 |
| > ½ to 1 Mile | 60 | 141 |
| >1 to 2 Miles | 92 | 216 |
| >2 to 3 Miles | 267 | 627 |
| >3 to 4 Miles | 52 | 122 |
| Total | 496 | 1,165 |

Figure 3 shows the Site 4-mile Target Distance Limit (TDL). There are no municipal water supplies within a 4-mile TDL of the Site. Therefore, a total population of approximately 1,165 people within the 4-mile TDL uses groundwater.

## Section 5.2 Surface Water

The surface water pathway consists of two sub-pathways, the surface water overland and groundwater-to-surface water migration pathways.

### 5.2.1 Surface Water Overland Migration Pathway

This pathway concerns the overland flow of surface water and its path to probable points of entry (PPE) into perennial surface water rivers, lakes, or streams. From there, the surface water pathway extends for 15 miles from the probable PPE. Figure 4 shows the surface water migration pathway within 15 miles TDL from the PPEs.

Surface water runoff from the northern and western portions of the Site drains to wetlands on the west side of the Site (PPE No. 1). Waters from the wetlands flow southeast approximately 1.5 miles into the Black River. Surface water in the Black River flows southwest, south, and then southeast for approximately 13.5 miles to the TDL.

Surface water runoff from the eastern portions of the Site drains to the wetlands on the west side of Lake Lory (PPE No. 2). Waters from these wetlands flow approximately 1.0 mile southwest into the Black River. Surface water in the Black River flows southwest, south, then southeast for approximately 14 miles to the TDL.

The 15-mile surface water pathway is contiguous to approximately 4.75 miles of sensitive wetland environments. The Black River is used recreationally and as a fishery (trout and northern pike). There are no known surface water intakes for human consumption along the 15-mile surface water pathway TDL.

Surface waters receiving runoff from the Site may be receiving hazardous acid drainage water. Acid drainage occurs when pyrite and other sulfide minerals are exposed to oxygen and water, causing oxidization and the subsequent creation of ferrous ions and sulfuric acid. Catalyzed by bacteria, the ferrous ions react further with oxygen, producing hydrated iron oxide. Acid drainage can lower the pH of surrounding water, making it corrosive and unable to support many forms of aquatic life and surrounding vegetation. Mine water can also carry toxic, metal-bearing sediment into streams, which can kill waterborne plant and animal species. In extreme cases, acid drainage can kill all living organisms in nearby streams. Humans may also be subject to diseases by consuming drinking water and fish tissue with heavy metal content.

### 5.2.2 Groundwater-to-Surface Water Migration Pathway

Groundwater below the Site flows northwest toward wetlands of the Middle Branch of the Escanaba River (PPE No. 3). The Middle Branch of the Escanaba River flows east toward the Greenwood Reservoir.

The Middle Branch of the Escanaba River and the Greenwood Reservoir are used recreationally and as fisheries (brook trout, brown trout, bluegill, northern pike, pumpkinseed,

and black crappie). The 15-mile TDL for the groundwater-to-surface water pathway is contiguous to approximately 3.41 miles of sensitive wetland environments.

Kennecott's Notice of Migration of Contamination identifies 26 hazardous substances that had been detected in off-site wells. The presence of these contaminants was attributed to the Site because the wells were located downgradient (northwest) of the Site.

As of February 2010, the Escanaba River was subject to fish advisories at the Greenwood Reservoir because of selenium contamination. According to the U.S. Fish and Wildlife Service, nesting eagles have been identified within 2.5 miles of the Site. Eagles and other wildlife are present in the Site area and use the resources available in the Escanaba River watershed.

As part of the Phase II ESA, Foth collected 23 surface water samples and 25 sediment samples from Lake Lory, on-site tailings ponds, the Middle Branch of the Escanaba River, the West Branch of the Black River, and the Main Branch of the Black River. The surface water and sediment samples were analyzed for metals. The following seven metals were detected in the surface water samples: copper, lead, manganese, mercury, nickel, silver, and zinc. The following seven metals were detected in the sediment samples: arsenic, chromium, cobalt, copper, lead, nickel, and silver.

The following substances detected in the surface water samples also were detected in the stockpile samples collected as part of the Phase II ESA: copper, lead, manganese, nickel, and silver. The following substances detected in the sediment samples also were detected in the stockpile samples collected as part of the Phase II ESA: arsenic, chromium, cobalt, copper, lead, nickel, and silver. Therefore, an observed release to the surface water pathway is documented at the Site.

## Section 5.3 Soil Exposure

The Site is a 1,242-acre parcel of land in Humboldt, Marquette County, Michigan. The Site has been used for processing iron and gold ores. The Site contains several structures. No known barriers prevent or restrict Site access. No schools or daycare centers are located within 200 feet of the known contaminated portions of the Site.

As part of the Phase II ESA, Foth collected 91 soil samples and 20 stockpile samples from the Site. The soil samples were analyzed for metals, cyanide, and VOCs. Analytical results indicated the presence of 16 metals (aluminum, antimony, arsenic, boron, cobalt, iron, lead, lithium, magnesium, manganese, molybdenum, nickel, selenium, silver, thallium, and zinc), cyanide, and four VOCs (1,2,4-trimethylbenzene; 1,3,5-trimethylbenzene; n-propylbenzene; and s-butylbenzene). Therefore, an area of observed soil contamination is documented at the Site.

There are an estimated 200 people living within a 1-mile radius of the Site.

Marquette County contains several protected resources, including one threatened species, the Canada lynx (*Lynx canadensis*), and two endangered species, the gray wolf (*Canis lupus*) and Kirtland's warbler (*Dendroica kirtlandii*).

## Section 5.4 Air

Substantial air pollution can occur at mining sites during excavation and transportation. Fugitive dust, which is created at many stages of the mining process, may be a significant problem at some sites, depending on site conditions. The inherent toxicity of the dust depends on the proximity of environmental receptors and type(s) of ore being mined; and high levels of arsenic and lead, in windblown dust may pose the greatest risk. Sources of dust may be from road traffic in the mine pit and surrounding areas, rock crushers in pits and mills, and tailings ponds.

Dust control methods aim to reduce the amounts and concentrations of dust produced and to minimize human exposure to dust. Water sprays are used during ore transportation and crushing and can greatly reduce dust levels at a site. Dust suppressants, such as lignin sulfonates and magnesium chloride, can stabilize solid piles or tailing areas that might otherwise become airborne in windy conditions. After mine closure, revegetation or other stabilizing methods may be used for dust control.

An estimated 1,165 people live within a 4-mile radius of the Site as the table below summarizes.

| Distance From Site | Estimated Number of People |
|---|---|

| | |
|---|---|
| 0 to ¼ Mile | 0 |
| > ¼ to ½ Mile | 59 |
| > ½ to 1 Mile | 141 |
| >1 to 2 Miles | 216 |
| >2 to 3 Miles | 627 |
| >3 to 4 Miles | 122 |
| Total | 1,165 |

## Section 6.0 Summary

WESTON was tasked to evaluate the Site to determine its current and potential impact on surrounding human populations, area groundwater, and nearby surface water bodies. The evaluation was based on existing data for the Site and research of information available for the Site area and processes.

The Site is an approximately 1,242-acre parcel of land in Humboldt Township, Marquette County, Michigan. The Site is bordered by State Route 28 to the north, vacant land and Lake Lory to the east, vacant land and wetlands to the south, and State Route 95 to the west. The L'Anse Indian Reservation is located approximately 23 miles from the Site.

The Site is relatively flat. Surface water runoff from the northern and western portions of the Site drains to wetlands on the west side of the Site. Water from the wetlands ultimately flows into the Black River. Surface water runoff from the eastern portions of the Site drains to the wetlands of Lake Lory. Water from these wetlands also ultimately flows into the Black River.

The Site began operation as an iron ore processing facility in 1954 and operated until 1979. In the early 1980s, the Site was refurbished to process gold ore containing metallic sulfide materials from the nearby Ropes Gold Mine. The Site operated as a gold ore processing facility from 1985 to 1989. The milling operation has been inactive since 1989. Kennecott currently owns the Site.

The 15-mile TDL for the surface water pathway from PPE No. 1 and PPE No. 2 is contiguous to approximately 4.75 miles of sensitive wetland environments. The Black River is

used recreationally and as a fishery (trout and northern pike). There are no known surface water intakes used for human consumption along this 15-mile TDL for the surface water pathway.

The 15-mile TDL for the groundwater-to-surface water pathway from PPE No. 3 is contiguous to approximately 3.41 miles of sensitive wetland environments. The Middle Branch of the Escanaba River and the Greenwood Reservoir are used recreationally and as fisheries (brook trout, brown trout, bluegill, northern pike, pumpkinseed, and black crappie). There are no known surface water intakes used for human consumption along this 15-mile TDL for the surface water pathway.

As part of the Phase II ESA, Foth collected 20 stockpile samples from the Site, The following 13 metals were detected in the stockpile samples: aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, and silver. Cyanide and three PCBs, including Aroclor-1260, Aroclor-1254, and Aroclor-1242, were also detected in the stockpile samples.

The following substances detected in the groundwater samples also were detected in the stockpile samples collected as part of the Phase II ESA: aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, manganese, and nickel. Therefore, a release to groundwater is documented at the Site.

The following substances detected in the surface water samples also were detected in the stockpile samples collected as part of the Phase II ESA: copper, lead, manganese, nickel, and silver. The following substances detected in the sediment samples also were detected in the stockpile samples collected as part of the Phase II ESA: arsenic, chromium, cobalt, copper, lead, nickel, and silver. Therefore, an observed release to the surface water pathway is documented at the Site.

As part of the Phase II ESA, Foth collected 91 soil samples and 20 stockpile samples from the Site. The soil samples were analyzed for metals, cyanide, and VOCs. Analytical results indicated the presence of 16 metals (aluminum, antimony, arsenic, boron, cobalt, iron, lead, lithium, magnesium, manganese, molybdenum, nickel, selenium, silver, thallium, and zinc),

cyanide, and four VOCs (1,2,4-trimethylbenzene; 1,3,5-trimethylbenzene; n-propylbenzene; and s-butylbenzene). Therefore, there is evidence of contamination at the Site.

## Section 7.0 References


Champion Township. Demographic and Township Information Regarding Water Supply. Accessed on April 8, 2010. On-line Address: http://www.championmichigan.org/.

Foth Infrastructure and Environment, LLC. Phase I Environmental Site Assessment for Former Humboldt Mill Site and Adjacent Property. August 2008.

Foth Infrastructure and Environment, LLC. Phase II Environmental Site Assessment for Humboldt Mill. August 2008.

Keweenaw Bay Indian Community. Letter to U.S. EPA Regarding Humboldt Mill Ore Processing Facility, Marquette County, Michigan. August 26, 2009.

Keweenaw Bay Indian Community. Letter to U.S. EPA Regarding Humboldt Mill Processing Facility, Marquette County, Michigan. February 5, 2010.

Keweenaw Bay Indian Community. Letter to U.S. EPA Regarding Humboldt Mill Ore Processing Facility. March 25, 2010.

Michigan Department of Environmental Quality (MDEQ). Part 201 Contaminated Sites Search for Marquette County. Search Conducted on April 5, 2010.

Michigan Department of Natural Resources (MDNR). Master Angler's Entries for Greenwood Reservoir. Updated 2009.

MDNR. Michigan Fishing Guide. 2009.

MDNR. Fish Stocking Database for Marquette County. Updated 2009.

MDNR. Bedrock Geology of Michigan Map. 1987.

MDNR. Quaternary Geology of Michigan Map. 1987.

United States Environmental Protection Agency (U.S. EPA). Sector Notebook: Metal Mining. September 1995.

U.S. EPA. Resource Conservation and Recovery Act Information Database, Query Results for Marquette County. Search Conducted on April 5, 2010.

U.S. EPA. Letter to Keweenaw Bay Indian Community Regarding Response to Letter Dated August 26, 2009. October 16, 2009.

U.S. Fish and Wildlife Service. County Distribution of Michigan's Federally Threatened, Endangered, Proposed, and Candidate Species. Revised July 2009.

United States Geological Survey (USGS). Topographic Map, Champion, Michigan, Quadrangle. 1955.

USGS. Topographic Map, Diorite, Michigan, Quadrangle. 1955.

USGS. Topographic Map, Greenwood, Michigan, Quadrangle. 1955.

USGS. Topographic Map, Marquette, Michigan, Quadrangle. 1955.

USGS. Topographic Map, Michigamme, Michigan, Quadrangle. 1956.

USGS. Topographic Map, Republic, Michigan, Quadrangle. 1955.

USGS. Topographic Map, Witch Lake, Michigan, Quadrangle. 1955.

USGS. Baraga Group; Michigamme Formation; Mafic to Intermediate Flows and Pyroclastic Rocks, Including Clarksburg Volcanics Member. Accessed on April 2, 2010. On-line Address: http://tin.er.usgs.gov/geology/state/sgmc-unit.php?unit=MIXmvl;0.

USGS. Menominee Group, Undivided. Accessed on April 2, 2010. On-line Address: http://tin.er.usgs.gov/geology/state/sgmc-unit.php?unit=MIXmu;0.

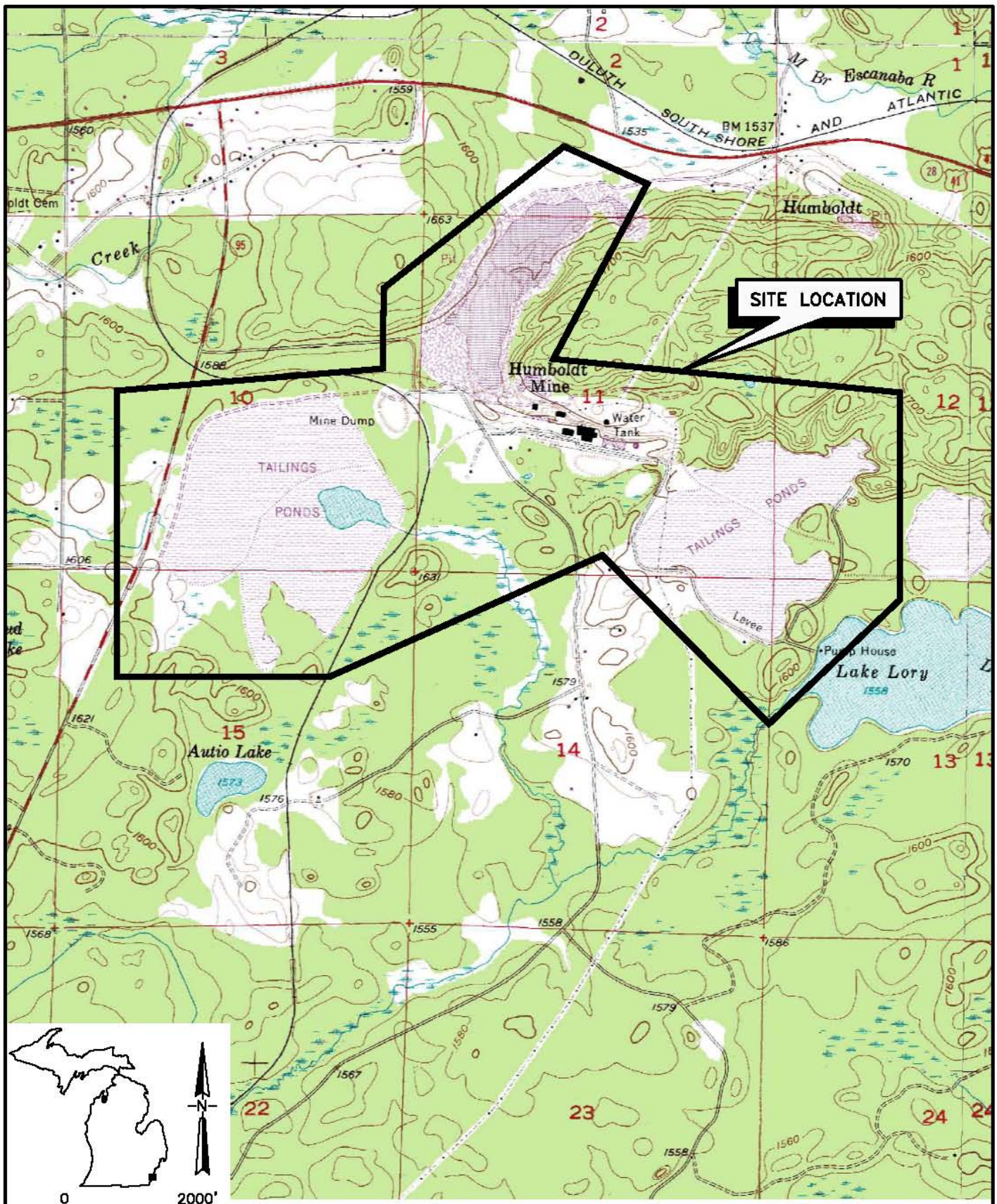
USGS. Migmatitic Gneiss and Amphibolite (Late to Early Archean). Accessed on April 2, 2010. On-line Address: http://tin.er.usgs.gov/geology/state/sgmc-unit.php?unit=MIAgn;0.

Weston Solutions, Inc (WESTON). Project Note Regarding Private Wells Within 4-Mile Radius of Humboldt Mill Site. April 19, 2010.

WESTON. Telephone Conversation Record Regarding Municipal Water Supplies Within 4-Mile Radius of Humboldt Mill Site. April 6, 2010.

WESTON. Longitude-Latitude Calculation. March 1, 2010.

# FIGURES




SOURCE: U.S.G.S. 7.5 MINUTE TOPOGRAPHIC MAPS.
REPUBLIC, MICHIGAN QUADRANGLE.

Prepared for:
U.S. EPA. REGION V
Contract No: EP-S5-06-04
TDD: S05-0008-1002-028
DCN: 955-2A-AHKM

Prepared by:
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**Figure 1**
**Site Location Map**
Humbolt Mill Site Preliminary Assessment
Humbolt, Marquette County, Michigan

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26,019,000 E
26,019,500 E
26,020,000 E
26,020,500 E
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622,000 N
621,500 N
621,000 N

HUMBOLDT TAILINGS DISPOSAL FACILITY
OLD CRUSHER BUILDING
ELECTRICAL SUBSTATION
FORMER CRUDE ORE STOCKPILE
CRUSHER PLANT
FORMER SECONDARY CRUSHER BUILDING
HA-1BP
HA-2BP
HA-3BP
BURIED PYRITE
DIESEL AND GAS USTS
MOTOR CONTROL UNIT
OFFICE/ MAINTENANCE BUILDING
MAIN MILL
PYRITE AST
FUEL OIL AST
FORMER CONCENTRATE STOCKPILE
FORMER PYRITE STOCKPILE
SOUTH STORAGE PILE A
FORMER PELLET PLANT
R.R. LOADOUT
CR 601
STORMWATER OUTFALL
SEPTIC SYSTEM
FORMER LEACH RESIDUE STOCKPILE

LEGEND

- EXISTING ELEV. CONTOUR IN FEET
- SPOT ELEVATION
- TREE
- TREE LINE
- BUILDING
- TRAIL
- PAVED ROAD
- UNPAVED ROAD
- STREAM/LAKE
- SURFACE WATER
- HUMBOLDT TAILINGS DISPOSAL FACILITY
- KEMC PROJECT LOCATION
- ▲ 19 COMPOSITE SAMPLE NUMBER AND LOCATION
- ● 20 SINGLE SAMPLE NUMBER AND LOCATION

NOTES:

1. TOPOGRAPHIC AND PLANIMETRIC DATA SUPPLIED BY AERO-METRIC ENGINEERING, SHEBOYGAN, WISCONSIN. DATE OF PHOTOGRAPHY: APRIL 27, 2006.
2. CONTOUR INTERVAL BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. HORIZONTAL DATUM BASED ON NAD 83/96. HORIZONTAL COORDINATES BASED ON MICHIGAN STATE PLANE.
3. KEMC PROJECT LOCATION WITHIN SECTIONS 2 AND 11, T47N, R29W, TOWN OF HUMBOLDT, MARQUETTE COUNTY, MICHIGAN.

N

0 200'
SCALE

SOURCE: FIGURE 4-3, PHASE II ESA.

Prepared for:
U.S. EPA. REGION V
Contract No: EP-S5-06-04
TDD: S05-0008-1002-028
DCN: 955-2A-AHKM

Prepared by:
WESTON SOLUTIONS, INC.
750 E. Bunker Ct.
Vernon Hills, IL 60061

**Figure 2**
**Site Features Map**
Humbolt Mill Site Preliminary Assessment
Humbolt, Marquette County, Michigan

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4–MILE

3–MILE

2–MILE

1–MILE

1/2–MILE

1/4–MILE

SITE LOCATION

# FIGURE 3
# 4–MILE RADIUS MAP
# HUMBOLDT MILL SITE
# PRELIMINARY ASSESSMENT
# HUMBOLDT TOWNSHIP,
# MARQUETTE COUNTY, MICHIGAN

MICHIGAMME, MICH.
SE/4 MICHIGAMME 15' QUADRANGLE
N4630—W8500/7.5
1956
AMS 3377 II SE–SERIES V882

CHAMPION, MICH.
SW/4 CHAMPION 15' QUADRANGLE
N4630—W8752.5/7.5
1955
PHOTOINSPECTED 1975
AMS 3477 III SW–SERIES V882

DIORITE, MICH.
SE/4 CHAMPION 15' QUADRANGLE
46087-E7-1T-024
1955
PHOTOINSPECTED 1975
DMA 3477 III SE–SERIES V882

WITCH LAKE NE, MICH.
NE/4 WITCH LAKE 15' QUADRANGLE
N4622.5—W8500/7.5
1955
AMS 3376 I NE–SERIES V882

REPUBLIC, MICH.
NW/4 REPUBLIC 15' QUADRANGLE
N4622.5—W8752.5/7.5
1955
PHOTOREVISED 1975
AMS 3476 IV NW–SERIES V882

GREENWOOD, MICH.
NE/4 REPUBLIC 15' QUADRANGLE
N4622.5—W8745/7.5
1955
PHOTOREVISED 1975
AMS 3476 IV NE–SERIES V882

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

DRAWN BY: DAVID HERNANDEZ
WESTON SOLUTIONS, INC.
APPROVED BY: OM PATEL
WESTON SOLUTIONS, INC.
DATE: MARCH 12, 2010

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PPE–3

PPE–1

PPE–2

# FIGURE 4
# SURFACE WATER PATHWAY MAP
# HUMBOLDT MILL SITE
# PRELIMINARY ASSESSMENT
# HUMBOLDT TOWNSHIP,
# MARQUETTE COUNTY, MICHIGAN

MICHIGAMME, MICH.
SE/4 MICHIGAMME 15' QUADRANGLE
N4630—W8800/7.5
1956
AMS 3377 II SE–SERIES V862

CHAMPION, MICH.
SW/4 CHAMPION 15' QUADRANGLE
N4630—W8752.5/7.5
1955
PHOTOINSPECTED 1975
AMS 3477 III SW–SERIES V862

DIORITE, MICH.
SE/4 CHAMPION 15' QUADRANGLE
46087-E7-1F-024
1955
PHOTOINSPECTED 1975
DMA 3477 III SE–SERIES V862

WITCH LAKE NE, MICH.
NE/4 WITCH LAKE 15' QUADRANGLE
N4622.5—W8800/7.5
1955
AMS 3376 I NE–SERIES V862

REPUBLIC, MICH.
NW/4 REPUBLIC 15' QUADRANGLE
N4622.5—W8752.5/7.5
1955
PHOTOREVISED 1975
AMS 3476 IV NW–SERIES V862

GREENWOOD, MICH.
NE/4 REPUBLIC 15' QUADRANGLE
N4622.5—W8745/7.5
1955
PHOTOREVISED 1975
AMS 3476 IV NE–SERIES V862

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETRE

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

DRAWN BY: DAVID HERNANDEZ
WESTON SOLUTIONS, INC.
APPROVED BY: OM PATEL
WESTON SOLUTIONS, INC.
DATE: MARCH 12, 2010

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